REMARKS/ARGUMENTS

Claims 1-3 and 5 are pending herein. Claim 1 has been rewritten merely to correct a minor matter of form. New claim 5 has been added hereby as supported by Fig. 3 and page 4, lines 21-31 of the substitute specification filed September 11, 2003, for example. Applicants respectfully submit that no new matter has been added.

1. Examiner Dong is thanked for courtesies extended to Applicants' representative during a telephonic interview on March 2, 2004, the substance of which has been incorporated below.

2. Claims 1-3 were rejected under §103(a) over Scott '889 in view of Scott '949. Applicants respectfully traverse this rejection.

Independent claim 1 recites a discharge vessel or chamber for a high-intensity discharge lamp, comprising a central body having a discharge space provided therein, two capillaries closing off respective end openings of the central body, and an electrode positioned within each respective one of the capillaries. The central body and the capillaries comprise an alumina material or an alumina-based ceramic material, and an average diameter of alumina grains in the capillaries is in a range of 10 μm to 25 μm.

Scott '889 teaches a method of producing a ceramic-metal-halide discharge lamp having a monolithic seal between a sapphire (single crystal alumina) arc tube and a polycrystalline alumina end cap. Referring to Fig. 1 of Scott '889, the arc tube 12 is formed from a single crystal alumina (sapphire) which is fully dense (see Scott '889, Col. 2, lines 32-33). The end caps 14 are formed from a polycrystalline ceramic material (polycrystalline alumina, PCA) which is in an un-sintered or "green" state (see Scott '889, Col. 2, lines 43-46). According to Scott '889, the "green" end caps 14 are initially heated to a pre-firing or pre-sintering temperature, and, once cooled, are placed over the ends of the arc tube to close off the open ends of the arc tube 12 (see Scott '889, Col. 3, lines 24-40). Scott '889 also discloses that the assembly is then heated to form a monolithic seal between the fully dense sapphire arc tube 12 and the PCA end caps 14, and that because the end caps 14 are "green," they "shrink as they

are heated to the sintering temperature. The sapphire arc tube 12 is fully dense so it does not shrink in size as it is heated" (see Scott '889, Col. 3, lines 41-44 and lines 53-56).

Scott '889 clearly discloses a fully densified (i.e., previously sintered) arc tube 12 that is provided with "green" end caps 14 that are then heated to form a monolithic seal between the arc tube and the end caps. Applicants respectfully submit that it is clear, based on the express disclosure in Scott '889, that the arc tube 12 is a fully densified sapphire (single crystal alumina) body that, as a single crystal body, does not include any discernable grain boundaries. Although Scott '889 specifically discloses that the end caps 14 are polycrystalline alumina rather than single crystal alumina, Applicants respectfully submit that there is no disclosure or suggestion whatsoever in Scott '889 regarding the grain size of any portion of the polycrystalline alumina end caps 14.

In the Office Action, Examiner Dong asserted that it would have been obvious for one of ordinary skill in the art to "utilize the sapphire tube body doped with minimal amount of MgO of Scott '949 for the ceramic metal halide lamp assembly of Scott '889 in order to provide a transparent discharge arc tube and maintains [sic, maintain] the structural integrity of the tube and thus prolong the lifetime of the lamp assembly" (Office Action, page 7, liens 10-14). Examiner Dong reiterated this position during the telephonic interview, as well.

Applicants recognize that Scott '889 does, in fact, disclose that the fully dense sapphire arc tube 12 can be produced by the sapphire arc tube producing method disclosed in Scott '949 (see Scott '889, Col. 2, lines 33-36). Even in view of the above, however, Applicants respectfully submit that the asserted combination would merely exchange one single crystal alumina arc tube body for another. That is, Applicants respectfully submit that the combined references still do not include any disclosure or suggestion regarding the grain size of the polycrystalline alumina in the end caps of Scott '889, since the asserted combination relates only to the substitution of the sapphire arc tube body 12 in Scott '889, and not the substitution of any portion of the PCA end caps 14 in Scott '889. In fact, Applicants respectfully submit that Scott '949 is silent with respect to end caps and capillaries all together.

During the telephonic interview, Examiner Dong asserted that one of ordinary skill in the art would have been motivated to use the doped PCA of Scott '949, which is used as an arc tube body, to instead make the PCA end caps of Scott '889. Applicants respectfully disagree.

In Scott '949 the sapphire is formed by decreasing the dopant amount, which is controlled by the sintering time, but Applicants respectfully submit that a single crystal cannot be generated if the dopant remains. Applicants respectfully submit that since Scott '949 merely relates to methods of producing a sapphire single crystal body, one of ordinary skill in the art would not have been motivated to use this material to process the PCA end caps 14 of Scott '889, even though the material and method are expressly suitable for producing the arc tube 12 of Scott '889.

Furthermore, Applicants respectfully submit that Examiner Dong did not provide any motivation for using the arc tube material of Scott '949 as the end cap material of Scott '889 other than to obtain the benefits of the claimed capillary grain size first disclosed by Applicants. It is impermissible, however, for the PTO to rely on hindsight and use Applicants' disclosure as a road map to justify combining references. Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to use the doped PCA of Scott '949, which is used as an arc tube body, to instead make the PCA end caps of Scott '889, and further submit that the PTO has not proffered any factual support to the contrary. Thus, Applicants respectfully submit that one of ordinary skill in the art could not possibly have arrived at the present invention in view of the applied references.

Further, in the Office Action, Examiner Dong asserted that "Applicant does not establish the criticality of the range of values, no testing nor analysis that is not obvious to one having ordinary skill in the art had been conducted to demonstrate the advantage and criticality of the claimed ranges" (Office Action, page 7, line 20--page 8, line 1). Applicants respectfully submit that this assertion is incorrect.

That is, Applicants respectfully submit that the present specification repeatedly indicates that controlling the average diameter of the alumina grains in the capillaries increases the physical strength of the capillaries. For example, see page 4, lines 1-3 of the substitute specification filed September 11, 2003. Improving the physical strength

by decreasing the average diameter of the alumina grains in the capillaries using magnesium oxide dopants prevents crack generation during electrode installation and eliminates the need for precise measurements with respect to a frit sealer. Reducing the average grain diameter of the alumina grains in the capillaries also eliminates the need to increase the thickness of the capillary portion in order to increase physical strength, which in turn permits the production of smaller, yet stronger lamps. This is also explained on page 4 of the substitute specification.

Applicants respectfully submit that the importance of the average grain diameter, with respect to physical strength, also corresponds to the relationship between the amount of magnesium oxide in the central body and the capillaries, as recited in claim 2. For example, the substitute specification recites that

> "At the ratio where the capillary 3 is greater in the amount of magnesium oxide than the central body 2, it can be smaller in the average diameter but higher in the physical strength than the central body 2. If the ratio is not greater than 1.5 times, the physical strength may hardly increase. When the ratio exceeds 25 times, the strength is not increased in proportion with the amount. Hence, the amount is preferably within a range of 1.5 times to 25 times."

Substitute Specification, page 4, lines 13-18.

Thus, Applicants respectfully submit that the record does indeed establish and support the importance of the average diameter of alumina grains in the capillaries, as recited in claim 1, and the importance of the dopant concentration recited in claim 2. For at least the foregoing reasons, Applicants respectfully submit that claims 1-3 clearly define patentable subject matter over the applied references.

New independent claim 5 recites a discharge vessel or chamber for a high-intensity discharge lamp comprising a central body having a discharge space provided therein, two capillaries closing off respective end openings of the central body and an electrode positioned within each respective one of the capillaries. The central body and the capillaries comprise an alumina material or an alumina-based ceramic material, the central body and the capillaries are simultaneously sintered, and an average diameter of alumina grains in the capillaries is in a range of 10 μm to 25 μm.

Applicants respectfully submit that new claim 5 defines patentable subject matter over the applied references for the same reasons explained above with respect to independent claim 1, and additionally for the following reasons.

Independent claim 5 positively recites that the central body and the capillaries are simultaneously sintered. Applicants respectfully submit that simultaneously sintering the capillaries and the central body as claimed provides a patentably distinct structure from Scott '889 and Scott '949. For example, in Scott '889, the "green" end caps 14 (see Scott '889, Col. 2, lines 43-46) are provided on the fully dense sapphire arc tube body 12 (see Scott '889, Col. 2, lines 32-33). Applicants respectfully submit that one of ordinary skill in the art would readily understand that in order to provide a fully densified sapphire arc tube body 12, the arc tube body 12 is necessarily sintered prior to positioning the green PCA end caps 14 thereon. The separate parts, that is, the fully dense arc tube body and green end caps 14, are then heat treated to a crystal growth temperature to create a monolithic seal between the arc tube 12 and the end caps 14 (see Scott '889, Col., 3, lines 41-43).

Applicants respectfully submit that one of ordinary skill in the art would readily understand that while the end caps 14 and arc tube assembly 12 are heated together to sinter the polycrystalline end caps 14 and form the monolithic seal between the end caps 14 and the arc tube 12, the fully densified sapphire arc tube 12 is not *simultaneously sintered* with the end caps 14, as recited in independent claim 5, since the sapphire arc tube 12 is already fully dense before the end caps 14 are provided thereon. Further, Applicants respectfully submit that there is no disclosure or suggestion in the secondary reference (Scott '949) with respect to forming end caps or capillary sections, much less simultaneously sintering such end caps along with the sapphire arc tube body.

For at least the foregoing reasons, Applicants respectfully submit that all claims pending herein define patentable subject matter over the applied references, and respectfully request that the above rejections be reconsidered and withdrawn.

If Examiner Dong believes that contact with Applicants' attorney would be advantageous toward the disposition of this case, he is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

March 16, 2004

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